I claim:

1. Apparatus for transferring heat energy to and from a body surface respectively from and to heat transfer fluid that is introduced into and removed from a space bounded by the body surface for heat transfer contact with the body surface, the apparatus comprising:

a body providing a body surface of cylindrical transverse cross section that is to be contacted by heat transfer fluid;

a heat exchanger element within a casing having a shape that provides between said heat exchanger element and the body surface a flow gap for flow of heat transfer fluid between the periphery of the element and the body surface in heat transfer contact with the body surface;

a first plenum at one end of the flow gap from which heat transfer fluid can flow through the flow gap, or into which heat transfer fluid can flow from the flow gap;

a second plenum at the other end of the flow gap respectively into which heat transfer fluid can flow from the flow gap, or from which heat transfer fluid can flow into the flow gap.

2. The apparatus as claimed in claim 1, further comprising a plurality of heat exchanger elements within the casing having a shape that provides between itself and the body surface a flow gap for flow of heat transfer fluid between the periphery of the plurality of elements and the body surface in heat transfer contact with the body surface, said plurality of elements having a plurality of first plenums and a plurality of second plenums, the plurality of first plenums being in communication with a common first passage means, and said second plurality of plenums of the elements being connected with a common second passage means.

3. The apparatus as claimed in claim 2, wherein the first passage means to the plurality of first plenums is a coaxial passage disposed adjacent the center of the element body, and the second common passage means to the second plurality of plenum is a coaxial passage disposed adjacent the center of the element body.

4. The apparatus as claimed in claim 1, wherein the body providing said body surface is cylindrical and of circular transverse cross section, and said heat exchanger element has a corresponding circular cross section.

5. The apparatus as claimed in claim 4, wherein the body is a cylindrical tube containing a plurality of heat exchanger elements of cylindrical shape disposed within the body.

6. The apparatus as claimed in claim 1, wherein said flow gap for flow of heat transfer fluid between the periphery of the element and the body surface in heat transfer contact with the body surface is annular.

7. The apparatus as claimed in claim 6, wherein said flow gap is comprised of a flow path from about 3 cm or less.

8. The apparatus as claimed in claim 6, wherein said flow gap is comprised of a flow path is about .5 cm.

9. The apparatus of claim 1, wherein said flow gap of said heat exchanger element has a longitudinal dimension that substantially corresponds to the longitudinal dimension of said respective heat exchanger elements.

10. The apparatus of claim 2, wherein said flow gaps of said plurality of heat exchanger elements each have a longitudinal dimension that substantially corresponds to the longitudinal dimensions of said respective heat exchanger elements.

11. A method for imparting a desired temperature to a reaction process, said reaction process taking place at least in part in a Couette type chemical reactors, comprising:

providing a Couette type reactor apparatus having two cylinders, an outer stator and an inner rotor, mounted one inside the other for rotation relative to one another and providing an annular processing gap between the opposed stator inner and rotor outer surfaces, wherein said rotor defines a body having inner body and outer body surfaces, said inner body surface having cylindrical transverse cross section that is to be contacted by heat transfer fluid;

providing a heat exchanger element within **said rotor** having a shape that provides between said heat exchanger element and rotor inner body surface a flow gap for flow of heat transfer fluid between the periphery of the heat exchanger element and rotor inner body surface in heat transfer contact with the rotor outer body surface, said flow gap having a first plenum at one end of the flow gap from which heat transfer fluid can flow through the flow gap, or into which heat transfer fluid can flow from the flow gap and a second plenum at the other end of the flow gap respectively into which heat transfer fluid can flow from the flow gap, or from which heat transfer fluid can flow into the flow gap:

introducing a heat transfer fluid between the periphery of the element and rotor inner body surface in heat transfer contact with the outer rotor body surface;

activating said inner rotor;

allowing the temperature of said outer body surface of said rotor to change;

introducing reaction components into at least one inlet;

reacting the reaction components within said annular processing gap; and

collecting at least one reaction product from at least one outlet.

12. The method of claim 11, wherein said flow gap for flow of heat transfer fluid between the periphery of the element and the rotor inner body surface in heat transfer contact with the outer rotor outer body surface is annular.

13. The method of claim 11, said flow gap is comprised of a flow path of about 3 cm or less.